

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
12 May 2005 (12.05.2005)

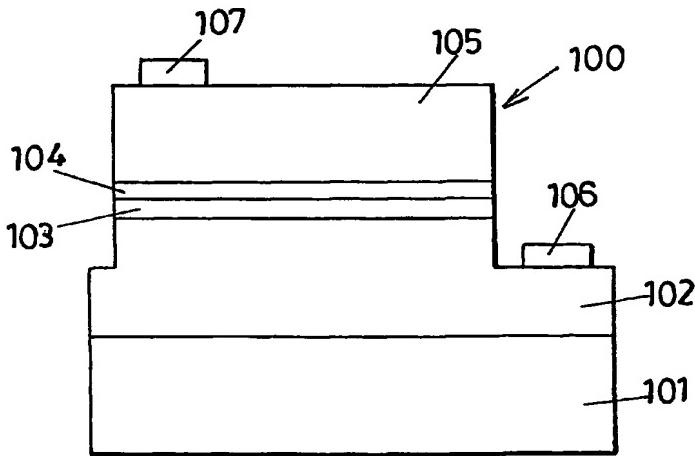
PCT

(10) International Publication Number
WO 2005/043635 A1

- (51) International Patent Classification⁷: H01L 33/00,
H01S 5/323
- (21) International Application Number:
PCT/JP2004/016076
- (22) International Filing Date: 22 October 2004 (22.10.2004)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
2003-371837 31 October 2003 (31.10.2003) JP
60/518,743 12 November 2003 (12.11.2003) US
- (71) Applicant (for all designated States except US): SHOWA DENKO K.K. [JP/JP]; 13-9, Shiba Daimon 1-chome, Minato-ku, Tokyo 105-8518 (JP).
- (72) Inventors; and
- (75) Inventors/Applicants (for US only): ODAWARA, Michiya [JP/JP]; c/o Showa Denko K.K., 1505, Shimokagemori, Chichibu-shi, Saitama 369-1871 (JP). KASHAHARA, Akira [JP/JP]; c/o Showa Denko K.K., 1505,
- Shimokagemori, Chichibu-shi, Saitama 369-1871 (JP). UDAGAWA, Takashi [JP/JP]; c/o Showa Denko K.K., 1505, Shimokagemori, Chichibu-shi, Saitama 369-1871 (JP).
- (74) Agents: FUKUDA, Kenzo et al.; Kashiwaya Building, 6-13, Nishishinbashi 1-chome, Minato-ku, Tokyo 105-0003 (JP).
- (81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.
- (84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PL, PT, RO, SE, SI,

[Continued on next page]

(54) Title: COMPOUND SEMICONDUCTOR LIGHT-EMITTING DEVICE HAVING PN-JUNCTION TYPE HETERO STRUCTURE AND FORMING METHOD THEREOF



(57) Abstract: A pn-heterojunction compound semiconductor light-emitting device includes a crystalline substrate 101, a lower cladding layer 102 formed on a surface of the crystalline substrate and composed of an n-type Group III-V compound semiconductor, a light-emitting layer 103 formed on a surface of the lower cladding layer and composed of an n-type Group III-V compound semiconductor, an upper cladding layer 105 formed on a surface of the light-emitting layer and composed of p-type boron phosphide, an n-type electrode 106 attached to the lower cladding layer and a p-type electrode 107 attached to the upper cladding layer. The lower and upper cladding layers are opposed to each other and sandwich the light-emitting layer to form, in cooperation with the light-emitting layer, a light-emitting portion of a pn-heterojunction structure. The light-emitting device has an intermediate layer 104 composed of an n-type boron-containing Group III-V compound between the light-emitting layer and the upper cladding layer.

WO 2005/043635 A1



SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ,
GW, ML, MR, NE, SN, TD, TG).

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

Published:

— *with international search report*